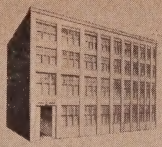
the CORNELL-DUBILIER Capacitor



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C-D
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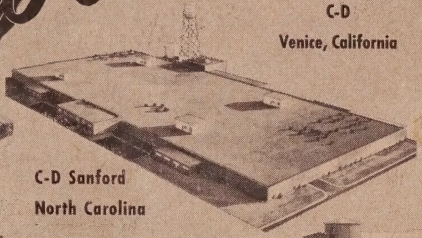

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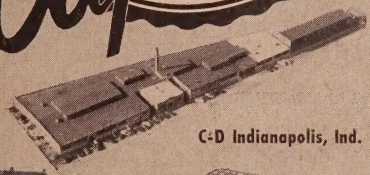

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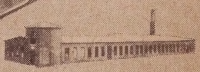

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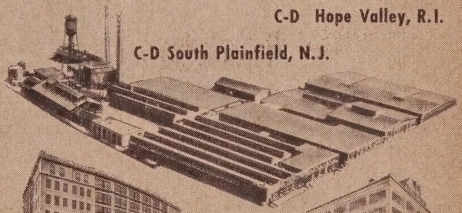

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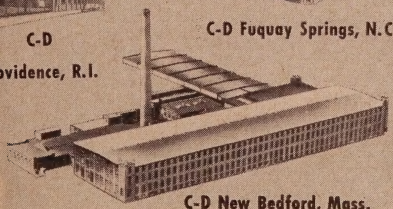

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To You . . . whom we think of as a friend and for whose pleasure and profit "The Capacitor" is dedicated, we sincerely wish a **New Year** of continued happiness and prosperity.

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CALIBRATION OF SERVICE TEST EQUIPMENT

The radio-tv service technician is prone to take his test instruments for granted. This is particularly true when the equipment is not of cheap grade. However, test instruments, like other electronic systems, can and do drift out of adjustment over a period of time and need to be checked and re-calibrated. The technician who has learned to lean heavily upon a set of instruments stands to lose the most from inaccuracies. But whether an instrument is used continuously or only occasionally, its calibration should be checked with some regularity and any necessary re-adjustments made.

CORRECTION

On Page 7 of the October 1955 issue of "The Capacitor," in Fig. 3D, a fixed capacitor should be shown connected between the tuning capacitor rotors and ground.

On Page 8 of the same issue, equation (4) should be written:

$$C = \frac{10^6}{6.28f\,(0.9E_p^2/30P)}$$

While the best policy undoubtedly is to return an instrument to its manufacturer or his nearest service station, or to send it to a standardizing laboratory for re-calibration, this is not always convenient or affordable. In such cases, which must be numerous, the responsibility for instrument calibration rests with the owner.

Most technicians will argue lack of calibration equipment. Nevertheless, it is of interest to consider the amount of useful calibration work that can be done with common equipment that is available. This article describes a few of the techniques which can be utilized in the average shop.

Meters

Current Meters. An ammeter, milliammeter, or microammeter may be checked against a similar meter of known accuracy or it may be checked in terms of current flow from a known voltage source through a known resistance, and the voltage drop across this resistance.

Figure 1(A) shows the meter comparison method. The standard meter (M_1) must have a range comparable to that of the meter (M_2) under test.

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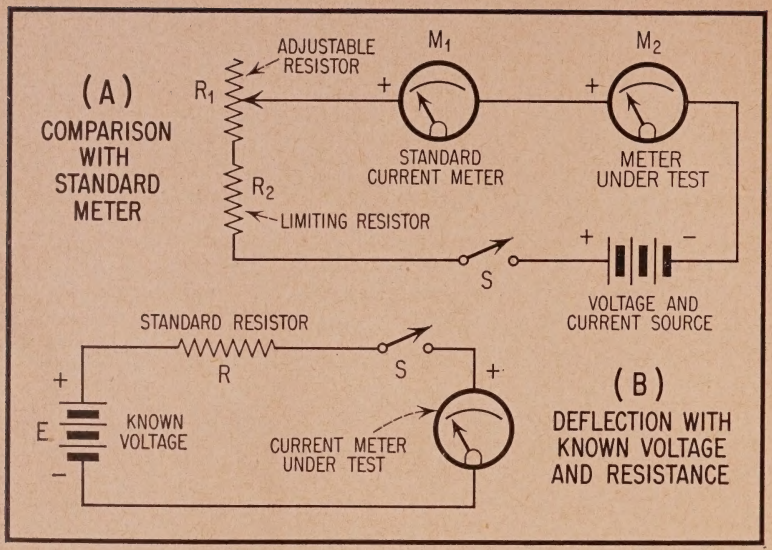


Fig. 1. Current Meter Calibration.

The best situation is when the scales of both meters are identical. Since this is not always possible, keep the scales as close together in range as possible. M_1 need not be a precision laboratory meter, as long as it is an instrument in good shape and is known to be of good accuracy. Every well-equipped shop has some one dependable meter which can be used. Often this instrument simply is a **new** meter that has received no abuse or extensive used.

The procedure is simply to adjust rheostat R_1 for deflections at various points on the scales and to compare the readings of M_2 with those of M_1. The purpose of the fixed resistor, R_2, is to limit current in the circuit to a safe value if R_1 should happen to be set to zero resistance. The correct value of R_2 is that resistance equal to E/I, where E is the source voltage (in volts) and I (in amperes) is the full-scale deflection of the lowest-range meter of the two.

For example: Assume that E = 1½ volt, M_1 is a 0-150 d-c microammeter, and M_2 is a 0-100 d-c microammeter. M_2 has the lower full-scale value, so I = 0.0001 amp. R_2 = 1.5/0.0001 = 15,000 ohms. This value of protective resistance will hold the circuit current to a maximum of 100 ua and neither meter can be damaged.

The adjustable resistor, R_1, is chosen in value such that the meter deflection may be varied from full scale to zero. The wattage of both R_1 and R_2 must be $2xI^2R$, where I is the maximum current (in amperes) which will flow in the circuit, and R is R_1 in one case and R_2 in the other.

Figure 1(B) shows the use of a calibrated resistor and a known voltage source. Here, the calibration current is equal to $E/R + r_m$, where E is the source voltage, R the standard resistance (ohms), and r_m the internal resistance of the meter. The current value is in amperes. The internal resistance of the meter becomes im-

portant only when r_m is comparable to R. Resistance r_m usually can be taken from the meter manufacturer's literature with sufficient accuracy for practical purposes. The voltage source, E, can be a fresh cell or battery assumed to deliver its nominal voltage (for example, 1½ v), or the cell may be checked for voltage at the place of purchase. A freshly-charged storage cell or battery is somewhat superior to dry cells.

Figure 2 shows a setup of the circuit given in Figure 1(B), using Cornell-Dubilier Model RDA, RDB, and RDC decade resistors in series as the standard resistor, R. Together, these decades provide a resistance range of 0 to 1 megohm in 1-ohm steps.

Alternating current meters may be checked in circuits similar to those shown in Figure 1, except that an a-c source must be substituted for the battery. The low-voltage secondary of a filament transformer operated from the power line will supply a useful a-c test voltage when the power-line frequency is suitable for the purpose.

Voltmeters. Test procedures for voltmeters are similar to those for current meters. Figure 3(A) shows the circuit for checking one voltmeter against another. The voltage, applied simultaneously to a standard voltmeter and the test meter, is set to various values by means of the potentiometer, R. For maximum stability, this should be a wirewound potentiometer. R can have a resistance value of 10,000 ohms and for input voltages (E) up to 100 v. can be of the volume-control type.

The standard voltmeter can be any second, reliable instrument. It can be simply a new meter which has not yet received rough handling.

Figure 3(B) shows a method which can be employed when there is no second comparison voltmeter but a dependable current meter is available. Here, the current (I) through an accurate 1000-ohm resistor, R_2, is set to various levels with the aid of rheostat R_1. The voltage drop (IR_2) across this resistor deflects the voltmeter and may be calculated simply by multiplying the current meter deflection by 1000. Similarly, the current which must be passed through the circuit to impress a desired voltage (E) upon the test meter may be determined by dividing E by 1000. Thus, in order to apply 10 volts to the test voltmeter, rheostat R_1 must be adjusted for a current level of 10 ma.

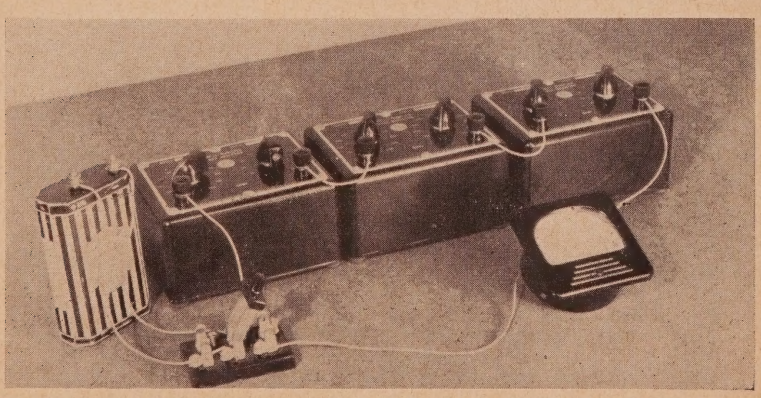


Fig. 2. Variable-Resistor arrangement for calibrating a D-C Milliammeter. Three series-connected resistance decade boxes are used with a 1½-volt cell according to the scheme shown in Figure 1(B).

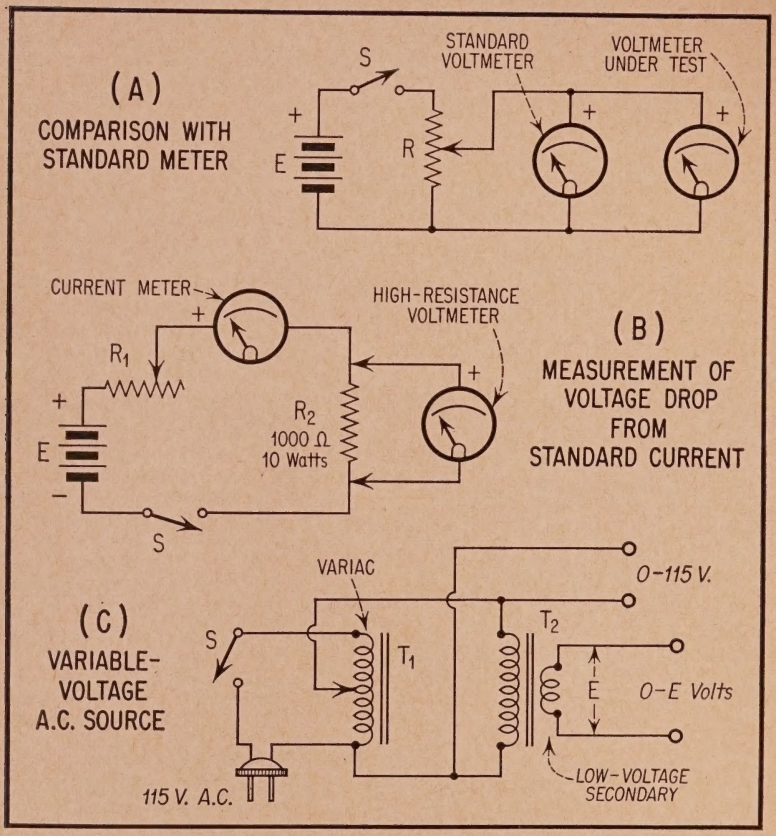


Fig. 3. Voltmeter Calibration.

This scheme often may be utilized, since a reliable milliammeter and 1000-ohm precision resistor frequently can be found in electronic shops. For best accuracy, the internal resistance of the test voltmeter must be at least 10,000 ohms (that is, at least 10 times the value of the shunting resistance, R_2).

Cells and batteries may be used to spot check a d-c voltmeter scale. Both conventional and v-t voltmeters may be checked in this manner. The scheme is simply to connect a battery of known voltage to the meter and note the deflection. As many voltages as practicable may be utilized. The reliability of the test depends upon how closely the battery voltage is known. This depends upon many factors, such as the freshness of the battery when the nominal voltage is used, and the accuracy of the test meter used originally to check the battery voltage. In the small shop, mercury cells are especially useful for this purpose. They make good, inexpensive secondary voltage standards, since they hold

their voltage of approximately 1.345 v. throughout their life and are unaffected by temperatures up to 250°F or by humidity.

Figure 3(C) shows an arrangement for use as an a-c voltage source in the calibration of a-c voltmeters (both conventional and vacuum-tube type). The voltage is continuously variable by means of a small-sized variable autotransformer, T_1 (General Radio 200-B Variac or Superior Type 10 Powerstat). A stepdown (filament-type) transformer, T_2, is operated from the autotransformer output. The secondary of this transformer delivers up to E volts, depending upon the setting of the autotransformer. An additional pair of terminals connected directly to the autotransformer output delivers up to 115 volts.

Vacuum-Tube Voltmeters. The d-c scales of a v-t voltmeter may be checked with either of the setups described in the preceding section in connection with Figures 3(A) and 3(B). The a-c scales may be checked with a continuously-variable a-c source, such as the arrangement shown in Figure 3(C), against a comparison voltmeter which may be either conventional or vacuum-tube type.

Figure 4 shows a setup for checking a low-voltage a-c vacuum-tube voltmeter. The continuously variable a-c voltage is supplied by the autotransformer and a 6.3-volt filament transformer, T. Figure 5 shows this actual setup, with the scales of an a-c vtvm being compared with the a-c scales of a multimeter.

Ohmmeters. The best way to check an ohmmeter is to connect it successively to various known resistances and note the readings. A wide range of values should be employed, in order to check all parts of the scales. Figure 6 shows sundry precision resistors and three resistance decade boxes (series-connected) being used to check the ohmmeter scales of a Simpson Model 260 multimeter. These three boxes (Cornell-Dubilier Models RDA, RDB, and RDC) give a coverage of 0 to 1 megohm in 1-ohm steps. The following resistance tolerances are provided:

Decade	Tolerance (plus or minus)
Units	5%
Tens	3%
Hundreds	3%
Thousands	3%
Ten Thousands	1%
Hundred Thousands	1%

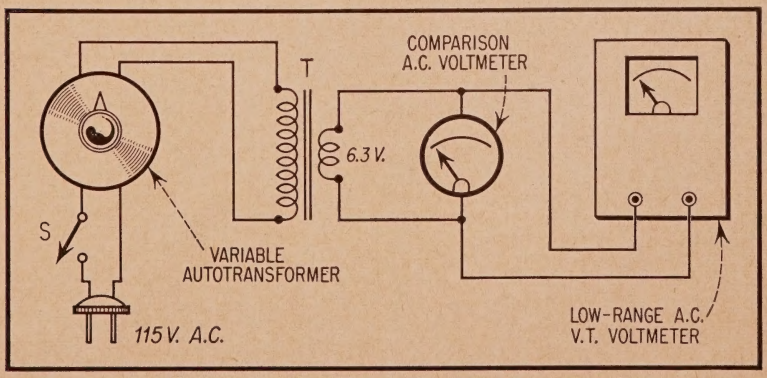


Fig. 4. Calibration of Low-Range A-C V-T Voltmeter.

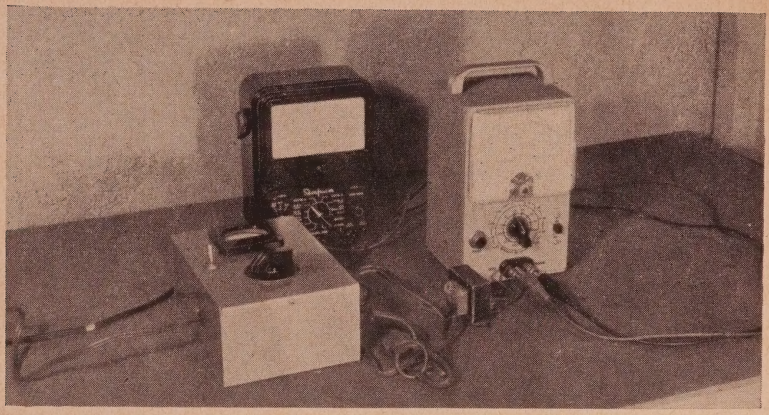


Fig. 5. V-T Voltmeter Calibration setup. The circuit is given in Figure 4. Here an adjustable autotransformer supplies the continuously variable calibrating voltage through a filament transformer. The vtvm is being checked against the a-c scales of the multimeter in background.

Bridges

The resistance-capacitance bridge is the type normally found in service shops, although some technicians also own resistance bridges of the d-c Wheatstone type, and a very few own inductance bridges.

The resistance ranges of the R-C bridge may be checked with a series of known resistors or several resistance decade boxes, exactly as described for ohmmeter calibration.

Capacitance ranges may be checked similarly with a series of known capacitors. Three Cornell-Dubilier capacitor decade boxes (Models CDA-5, CDB-3, and CDC-3) in parallel will cover the range 0.0001 to 1 microfarad in 100-uufd steps. Tolerance of ±5% is provided from 0.0001 to 0.011 ufd, and ±3% throughout the remainder of the capacitance range.

There is no simple way to check the calibration of the power factor balance control of the capacitance bridge. The technician can determine if this adjustment is working, however, by balancing the bridge for a high-quality 1- or 2-microfarad paper capacitor which is connected in series with a 10,000-ohm variable resistor. Set the variable resistor to several values and note how much the power factor control must be varied each time in order to obtain a capacitance null with the bridge.

Oscilloscopes

Vertical Sensitivity. Vertical gain usually is stated by the oscilloscope manufacturer as so many peak-to-peak volts per inch of deflection. This may be converted to rms voltage by dividing by 2.82. The obtained value of sinusoidal a-c voltage applied to the scope with the vertical gain "wide open" should give a 1-inch overall deflection.

To check the actual scale calibration, use the circuit shown in Figure 7. The bench setup is shown in Figure 8. With the vertical gain set to maximum, adjust the autotransformer for various vertical scale deflections from 1 division to full scale, and record the corresponding readings of the a-c voltmeter. To convert these voltage readings to peak-to-peak values, multiply them by 2.82. If the internal sweep of the oscilloscope is operated, the pattern will be a sine wave, and the vertical deflection must be measured

from positive peak to negative peak. If the sweep is disabled, a plain vertical line trace will be obtained, its simple length from end to end being the vertical deflection distance.

Horizontal Sensitivity. The gain of the horizontal channel may be checked in a similar manner: (1) Reduce the vertical gain to zero. (2) Transfer the calibration-voltage leads (Figure 7) from the vertical input to the horizontal input terminals of the scope. (3) Set the horizontal gain control to maximum. (4) As the autotransformer is adjusted, a straight horizontal line trace will be obtained. The calibration then is made in the same manner as explained under **Vertical Sensitivity,** except that deflection distances now are measured along this horizontal line.

Internal Calibrating Voltage. Several service-type oscilloscopes are provided with an internal calibrating voltage derived from the 60-cycle supply. The common value employed for this purpose is 1 volt peak-to-peak, and this potential is available at a panel binding post for calibration of the vertical and horizontal channels. This voltage may be corrected from time to time by means of an internal potentiometer.

To set the calibrating voltage to its 1 volt p-p level, connect a high-impedance a-c voltmeter (preferably of the vacuum-tube type) between the CALIBRATING VOLTAGE terminal and the COMMON terminal of the scope. Set the internal potentiometer for a meter reading of 0.355 volt rms. This value corresponds to 1 volt peak-to-peak.

Sweep Frequency. To check the frequency of the internal sweep oscillator: (1) Connect a variable-frequency sine-wave signal generator to the vertical amplifier input terminals. (2) Set the scope sweep to INTERNAL, sync to INTERNAL, and sweep frequency controls to the first test position. (3) Tune the signal generator for a **single, stationary** sine-wave cycle on the screen. At this point, the sweep frequency equals the generator frequency. (4) Repeat at each desired setting of the sweep frequency controls.

Signal Generators

Audio-Frequency. An audio oscillator may be checked against a source of one or several accurately-known audio

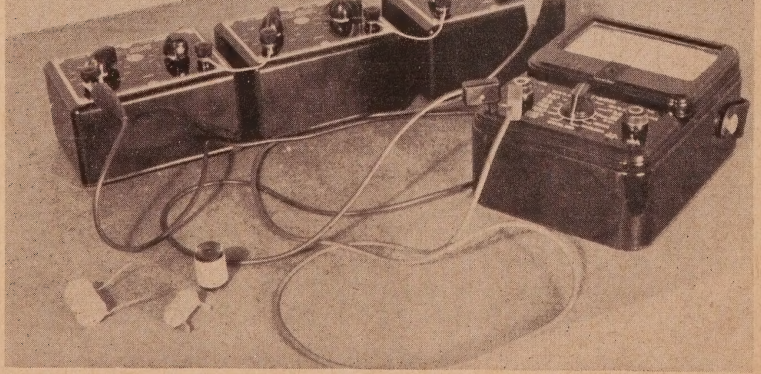


Fig. 6. Ohmmeter Calibration against Accurate Resistances. The series-connected decade boxes supply resistance values between 0 and 1 megohm in 1-ohm steps.

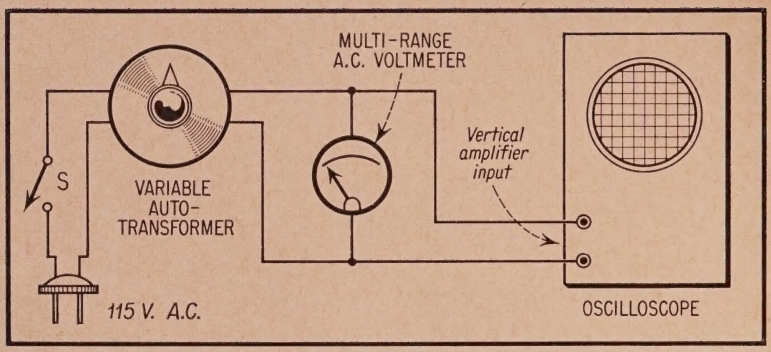


Fig. 7. Oscilloscope Deflection Calibration.

frequencies with the setup shown in Figure 9. The standard-frequency source may be 60 cycles derived from the a-c power line through a stepdown transformer (for example, a 6.3-volt filament transformer).

The following procedure is observed: (1) Switch-off the internal sweep oscillator of the oscilloscope. (2) Set the audio test oscillator tuning to obtain a single, stationary circle or ellipse on the scope screen. At this point, the oscillator is tuned to the standard frequency. (3) Other Lissajou's patterns are obtained at other settings of the test oscillator tuning to indicate that the oscillator is operating on a harmonic or subharmonic of the standard frequency. (For a further discussion of the use of this method, see **Frequency and Phase Measurements with the Oscilloscope.** C-D CAPACITOR, June, 1954.) In this way, a large number of oscillator dial points can be checked against a single-frequency standard source.

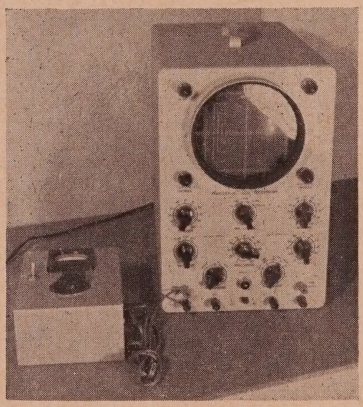


Fig. 8. Calibration setup for Vertical Channel of Oscilloscope. The variable autotransformer has a built-in a-c voltmeter. The vertical deflection is compared with the readings of this meter. A separate a-c voltmeter, instead, might be connected to the vertical input binding posts.

Radio-Frequency. The i-f and broadcast frequencies of an r-f test oscillator or signal generator may be checked very accurately by zero-beating the oscillator against broadcast station carriers. The oscillator should be loosely coupled to a broadcast receiver for this purpose. A satisfactory method of coupling is to connect the "high" terminal of the oscillator output to the antenna terminal of the receiver through a 25-uufd capacitor. The higher radio frequencies may be checked similarly by zero-beating against commercial short-wave carriers with the aid of an all-wave receiver.

For spot-checking the oscillator frequency dial at numerous points on all except the extreme high-frequency ranges, a 100-kc crystal oscillator can be used with a germanium diode mixer, as shown in Figure 10. The beat-note

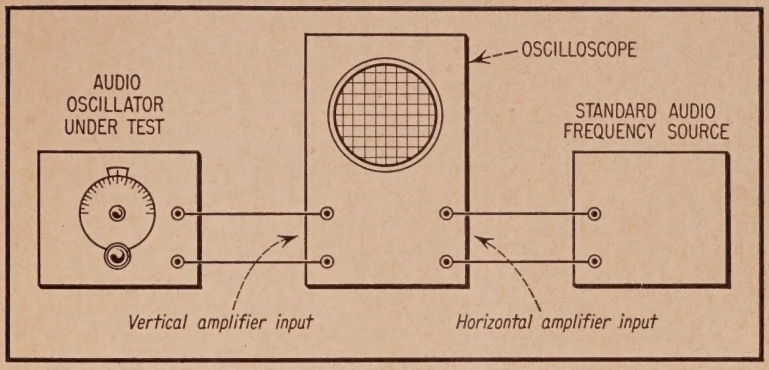


Fig. 9. Audio Frequency Calibration.

detector may be headphones, a-c vtvm, or oscilloscope. The r-f oscillator dial is tuned successively to zero beat at each multiple of 100 kc.

R-F Sweep Width. To check the calibration of the sweep width control in a sweep generator: (1) Operate the generator into an r-f amplifier tuned to the center frequency of the generator. (2) Operate an oscilloscope from the amplifier in the conventional manner to obtain a stable, resonance (response) pattern. (3) Loosely couple an accurate, unmodulated r-f signal generator (as a marker source) to the amplifier and tune this generator to produce a pip on the pattern. (4) Move this pip along the pattern by tuning the "marker generator." Note the marker generator frequency when the pip is at one extreme end of the pattern and also when at the other extreme end. Subtract one reading from the other to obtain the sweep width in megacycles.

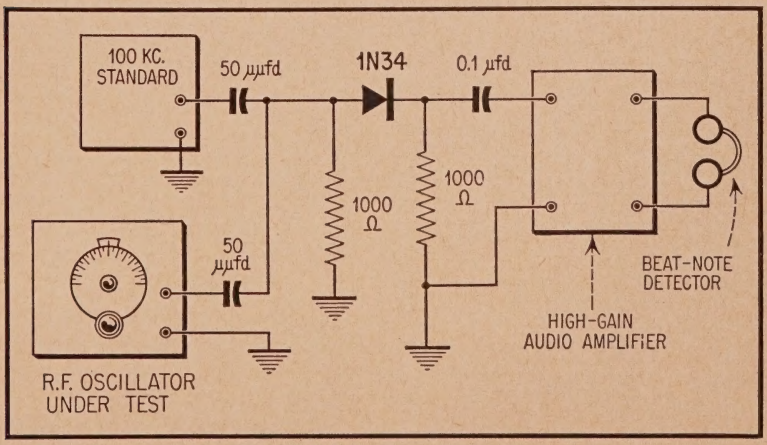
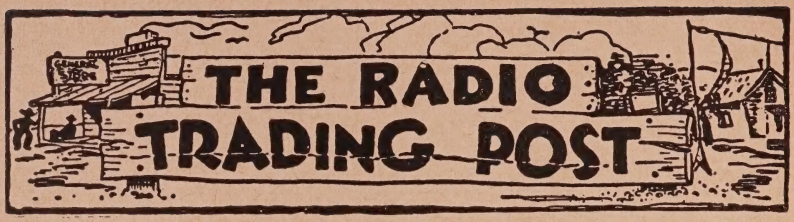


Fig. 10. R-F Oscillator Calibration.



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FOR SALE — Two like new 0-1 ma. meters, 4½" square bakelite case, 50 ohms internal resistance, VOM scale (can be used as replacements in Vomax test unit), $5.50 each postpaid. L. Wienreb, 151-09 34th Ave., Flushing 54, N. Y.

FOR SALE — National SOJ-3 Selec-o-jet, $15; 12 v. input, 425 v. 160 ma. output dynamotor, $12. R. Van, 412 Humboldt St., Rochester 10, N. Y.

WANTED — Sams Photofacts, and an 8 mm. projector. Will trade 1. n. BC-221 and book; 7" Eico scope; pair Handie-Talkies; Riders Vols. 1 thru 21. Snow, 1011 N. Forrest, Altus, Okla.

FOR SALE — Precise VTVM, completely wired and tested, manual, extra 5000 v. probe, $25 postpaid; also complete file of High-Fidelity magazine from first issue to date, $50 postpaid. H. Malamud, 122 Eames Pl., Bronx 68, N. Y.

FOR SALE — Signal tracer, $10; code practice oscillator, $10; two 5BP4 tubes, $5; Precision E-200-C sig. gen., $40; 750 VA isolation transformer Stancor PV6444, $5. M. C. Superville, 4614 Huisache St., Bellaire, Tex.

WANTED — Circuit diagram, tube line-up, or any information on Philharmonic model S-6, or tuner there from. Made in N. Y. about 1940. Also need diagram or manual for Boonton type 150-A sig. gen. W. H. Bauer, 119 North Birchwood Ave., Louisville 6, Ky.

WANT — Auto radios: 1950 to 1955 models for cash or exchange for tubes. Have '42-'48 Chrysler radios with speaker, $8 each, complete. Best Radio TV, 3349 Fulton Rd., Cleveland 9, Ohio.

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FOR SALE — Burgess-Robson NT200 VOM, 14 ranges, $12.50; commercial l. n. 20 w. amp. kit, complete except speaker, $15; 3 w. amp. kit, $6 50. A. Agostino, 223 S. Wine Biddle Ave., Pittsburgh 24, Pa.

FOR SALE — Latest Heath T-3 visual-aural signal tracer kit, with instructions, l. n., $21, plus postage. Joseph F. Dineen, 9 Winter Terr., Westwood, Mass.

SELL OR TRADE — RCA RP178 single-speed record changer, perf. mechanical cond.; used 17BP4A and 10BP4A picture tubes in operating cond. Interested in Hi-Fi, electronic instruments or photographic equip. D. Kurs, 321 Fairmount, Jersey City 6, N. J.

FOR SALE — Riders TV Vol. 1 and 2, $20; receiver BC-454-B 3-6 mc., $10; Eico 5" scope, $35. H. Gathercole, 45 Aberdeen Dr., Huntington, N. Y.

SELL OR SWAP — Heath 0-9 scope 5"; TS-3 TV sweep gen.; SQ-1 square wave gen., all factory calibrated OK, for 17" TV, South Florida only. William E. Warms, 3524 SW 25th Terr., Miami 33, Fla.

FOR SALE — Regency TV booster, $15; two car radios, '41 to '46 Dodge or Plymouth $10 and up; table model radios $7 and up, all in good working cond. Walter Jezerio, Box 3, Dillonvale, Ohio.

FOR SALE — Sylvania 16 AP4 and 12 LP4, Rauland 16 EP4 $8; Kuprox dry metallic disc trickle charger, amps. 8-10, $2. Thomas Byrne, 331 Calhoun Ave., Bronx 65, N. Y.

FOR SALE OR TRADE — GE 250 self charging portable radio; 3-band Audio oscillator; RCA 10" TV; Hallicrafter S-19R rcvr.; Eico tube tester. Paramount Service, Box 134, Atlanta, Mo.

WANTED — 0-20 DC milliammeter. Albert C. Hart, 207 N. Raymond St., Griffith, Ind.

WANTED — Complete Radio-TV course with or without kits. Send full particulars on price, age, cond. M. Price, 8684 20th Ave., Brooklyn 14, N. Y.

WANTED — Amateur radio equip. in trade for Martin 75 outboard motor, l. n.; Winchester model 12, 16 gauge; 22 cal. automatic rifle. Jacob Levy, 360 W. California St., Memphis 6, Tenn.

FOR SALE — Sprague Kwik-Test condenser checker, model KT-1, with instructions, used very little, $21.95 plus COD charges. Ben's Radio-TV, 1037 Joseph Ave., Rochester 21, N. Y.

WANTED — Late model Precision tube checker. Must be in perfect cond., for cash. L. Greenblatt, 144 40 77th Rd., Flushing, L. I., N. Y.

FOR SALE — Accumulation of several years Ham gear and parts, test equip. recorder, tubes, etc. R. Lackner, 2029 Bradley, Chicago, Ill.

FOR SALE — 500 w. DC to AC inverter, slightly used, ATR mfg., type 110 BT, model RHD, for $50. E. Mindes, 103-26 68th Rd., Forest Hills 75, Queens, N. Y.

FOR SALE — 325 w. xmitter, complete with modulator, dual power supplies, tuner and driver, exc. shape. All you need is ant. and 110 v. Don Broton, 318 Madison St., Stevens Point, Wis.

FOR SALE — Local only! Lafayette TV Booster with fine tuning and channel selector range switch, $5. M. Kantorowitz, 544 Claremont Pkwy., Bronx 57, N. Y.

FOR SALE — Hickok 550X Dynamic mutual conductance tube tester with built-in multimeter, $65 cash FOB, good cond. Sig Salmento, 616 Peaks St., Bedford, Va.

TRADE — Remington 60 deluxe shaver, l. n., for 3-speed record changer. P. Drechsler, 133 W. 10th St., New York 14, N. Y.

SELL OR TRADE — Used ⅓ hp. GE motors, speed 1750, $5. Daniel J. Umholtz, 392 Armstrong Ave., Jersey City 5, N. J.

SELL OR TRADE — 10 w. Hi-Fi amplifier, 15 dynamotors—6 v. - 425 v., 375 ma., 20 w. PA, 400 v., 90 ma. vibrapack, 1000 v., 275 ma. supply. Need grid dip, VOM, tube tester. Stan Zuchora, 2748 Meade St., Detroit 12, Mich.

TRADE — Large amplifier and record changer units for TV tubes or Sams manuals. Jack Moser's Machine Shop, R-1, Lewisburg, Pa.

FOR SALE — Ameco record code course, little used, $7 FOB. Alex Siegel, 1516 Shakespeare Ave., Bronx 52, N. Y.

SELL OR TRADE — Used ham gear, tubes, xformers, chokes, meters, condensers, etc. All correspondence answered. Wm. Toben, 121 W. Delano, Tucson, Ariz.

FOR SALE — Tube checker in good shape, checks most all latest type; E.M.C. model 200 roll chart, 1. n. Make offer. Greiner Radio-TV Service, 299 So. Elmwood Ave., Buffalo 1, N. Y.

SALE — Pilotuner model FM-607, exc. cond., $40 FOB. Hal Magargle, 3106 Sycamore La., Norristown, Pa.

FOR SALE — Precision E-200-C sig. gen., exc. cond. Best offer over $40. M. Rafayko, 180 Winston Ave., Lexington, Ky.

FOR SALE — Like new Eico multi-signal tracer, model 145, $17.50. N. Klock, 227 Fenimore Ave., Unionndale, L. I., N. Y.

WANTED — Webster electric Ekotape recorder, model 111, 7½ IPS. Write cond. and price. C. E. Maupin, 909 NW 23, Okla. City 6, Okla.

WANTED — Car radio in working cond. for 1950 Plymouth sedan. L. F. Duzak, 3535 Paris Ave., New Orleans, La.

FOR SALE — Portable 3-speed radio-phono, Firestone with V-M intermix and shut-off changer, perf. cond., only $44.95 and postage. Y. Brevda, Box 1162, Tampa, Fla.

SELL OR SWAP — Motorola 7" and 8" table model TV; Hickok audio sig. gen.; Heath Q meter and DX100 transmitter; Johnson Adventurer; Central Electronics API slicer adapter; electronic keyer; VHF 152. F. D. Bornman, 19491 Lowell Dr., Detroit 3, Mich.

FOR SALE — Airline tape recorders, self reversing, records both directions and sides, good cond., two for $85. Eugene Kon, 1516 Broadway, Buffalo 12, N. Y.

SELL OR TRADE — BC-645 xmitter-receiver for 420-460 mc., exc. cond., with 17 tubes, $18 FOB. Gene, 1001 Merritt St., Old Hickory, Tenn.

FOR SALE — Concertone 1501 tape recorder in carrying case with amplifier and speaker, less than 50 hrs. of careful use, $285. J. C. Geissinger, 1204 Oaks Ave., Compton, Calif.

WANTED — Copy of U.S. Navy book, "Advanced Mathematics for Electronics Technicians" (1951). (Reprinted with changes in 1953.) State price. D. Deer, 3917 Madison St., Hyattsville, Md.

FOR SALE — Grommes custom 205 PA pre-amp. and 100 BA basic amp., $25; Astatic TV-VHF booster, AT-1, $9; UHF B-T lab converter model 99 $9; Granco UHF converter, model LCU, $9. R. Slinkman, 610 Walton St., Lemoyne, Pa.

WANTED — Preselector DB23 or equiv., state price and cond. Have pair 4-125A to trade. Bob Reagan, 2401 Parkway Dr., Winston-Salem, N. C.

FOR SALE — Harvey-Wells TBS50A with heavy-duty fixed power supply and new PE-103, crystals, all for $100; exc. BC-348 and speaker enclosed power supply, AVC, noise silencer "S" meter, $50. S. M. Dinsmore, 140 Hacker Rd., Dayton 5, Ohio.

SELL OR SWAP — Like new transvision CRT tester-reactivator, $15, or will pay balance on trade for reasonably priced tube tester. B. J. Watkins, 735 Washington St., Cape May, N. J.

SWAP — Monitor 51A radio 30-50 mc., for communication receiver. Charles Fernandez, 81 Warren St., Roxbury 19, Mass.

FOR SALE — Freq meter BC-221-Q (Cardwell), complete, $60; antenna tuner, 7-14 mc., $35. Albert P. Schlachter, 7724 Kelly St., Pittsburgh 21, Pa.

SELL OR TRADE — Mobile xmitter-rcvr., 152-162 mc, FM, 10 w., 6 v. power supply, can be used on 120 v. AC. Want ham gear. H. A. Freiberger, 1810 Third Ave. No., Texas City, Tex.

SELL OR TRADE — Hickok 133B VOM, 25,000 ohms per volt; Hickok 540 tube tester; Philco 7050 tube tester, Solar model CC capacitor tester, all A-1 cond. Want guns. S. S. Canfield, 1430 E. 55th St., Cleveland 3, Ohio.

SWAP — German 10 power x 50 field glasses and/or German 7 power x 30 binoculars, exc. cond., for good scope. E. T. Bruno, 103 Vassar Rd., Poughkeepsie, N. Y.

SWAP — Eico 944K flyback tester, l. n., for Eico 1050K 6-12 v. battery eliminator, l. n. Richard Kuntz, 3900 King's H'way, Brooklyn 34, N. Y.

TRADE — Philco 077 sig. Gen. for late CREI correspondence courses I and II, or other school courses. S. J. Tendler, 1184 Walton Ave., Bronx 52, N. Y.

WANTED — Johnson "Matchbox" ant. coupler. State cond. and price in first letter. Eddie Gigliotti, 249 So. Main St., Bangor, Pa.

SELL OR SWAP — C-D, 100 mfd. 4000 v. oil-filled condenser vitamin-Q, cost $100, for cash or ham gear. David Knepper, RD 1, Sidman, Pa.

WANTED — Sams folders. State numbers, cond., and price. Ray Herin, 1130 Wren Ave., Miami Springs, Fla.

FOR SALE — Back OST's $1.25 per year. J. D. Harrow, 111 Lakeshore Dr., Westwood, Mass.

FOR SALE — Heathkit AT-1 xmitter, 30 w., $25, good cond.; Heath shortwave rcvr., $22 with case. Both, $45. Rett Oren, 324 Highwood Ave., Leonia, N. J.

FOR SALE — National HFS rcvr. with power supply, 27 to 250 mcs., $85. Paul Gorbatch, Jr., 1506 Steiner Pl., Asbury Park, N. J.

WILL BUY — Any information, material, and books pertaining to repair and maintenance of juke boxes. Yale Phonograph Co., Box 1162, Tampa, Fla.

FOR SALE — Large number of used tubes meter tested such as 27, 24, 45's for 25c each post paid; also Underwood typewriter. Louis Goldstone, 1279 Sheridan Ave., Bronx 56, N. Y.

SEL OR TRADE — Surplus tubes, synchros, motors, test equip., parts, etc. Best offer or trade. S. Consalvo, 4905 Roanne Drive, Wash. 21, D. C.

FOR SALE — Mercury II camera with built-in flash, F1.9 coated lens, 1/10 to 1000 sec. shutter speed, 1' 6" to infinity with filters. Best offer. Ben Cheskis, 2661 N. Napa St., Phila. 32, Pa.

FOR SALE — Alexander Hamilton modern business course in 26 vols., original $180, sell for $75 incl. guides, lectures, and problems. Vern Worden, Friend, Neb.

FOR SALE — Marsland multitester, external multiplier to 10,000 v. DC, 5,000 v. AC, with hi-test leads; model 18555 (422) UTC choke, S-36, 400 ma.; Hickok 303 VTVM with cables. S. R. Feller, 3109 Brighton 7th St., Brooklyn 35, N. Y.

FOR SALE — Hallicrafters portable and radio, practically new, $60. Roy L. Baldini, 7 Mildred St., Logansport, Ind.

WANTED — TV set, Hi-Fi, or test equip. Trade professional portrait camera. Alex Cohen, 64-33 99th St., Rego Park 74, N. Y. C.

FOR SALE — ARC-5 2-meter xmitter, 3 crystals, $15; BC221, calibration book, $50; ARC5, 3 to 4 mc., $10; 7-9 mc., $8; 5-7, 20 meter output, $6; 829B, $6; 832As, $3. Steward J. Ringler, 121 S. 11th St., Reading, Pa.

FOR SALE — 25 coin-operated radios, 6-tube in wood cabinets, operate 1 hr. 25c, guaranteed, $12 FOB. B. Taylor, 1307 Vultee Blvd., Nashville, Tenn.

FOR SALE — 365 tubes some in new cartons, No. 12, 5 v. series or TV tubes, loctals, octals and battery types, 30c ea. or $75 for all. Donald Schotanus, 1864½ Glendale Blvd., Los Angeles 26, Calif.

SELL OR SWAP — Used ID6B-APN4 scope; R89/ARN-5A rcvr.; BC645 l. n. transceiver; 304 TL tubes. Want drill press, paint sprayer, or air horns for truck. A. Csuti, 11727 Offley Ave., Norwalk, Calif.

SELL — National SW-54; GE self-charging portable; Radio News from 1945 to 1952; OST 1944 to 1953; Admiral 16" TV; Triplett 3413 tube tester. Charles Horn, 325 E. 163 St., New York 51, N. Y.

FOR SALE — TV and Radio Service Store, busy service section, near bus stops, small apartment, yard. Make offer. Paragon TV & Radio Service, 170-26 Jamaica Ave., Jamaica 32, L. I.

FOR SALE — Riders vol. 6 thru 17, $40; Triplett 1632 sig. gen., $20, in good cond.; Sylvania 543B, clock radio, ebony black, panelescent dial, l. n., $25. C. E. Wheeler, 295 Cerritos Ave., Long Beach 2, Calif.

FOR SALE — Superior 450 tube tester; Supreme 504 tube and set tester, $10 each or make offer; Regency transistor radio, model TR1 cost $50, make offer. L. E. Walker, 118 Columbus, Lead, S. D.

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION

"In the first half of this century we have been in two big wars. They were different than previous wars because, in far greater measure than ever before, supremacy in science and industry was necessary to victory. We learned in the first world war that if we were to be prepared for defense or win a future war then our science and industry would have to be prepared fully as much as our armed forces. We thought about this a lot in the 20's and 30's but actually did little or nothing constructive about it.

"The second of the big wars brought home to us that we could no longer merely THINK that science and industry should be included in preparedness — they HAD to be. We learned that, in order to accomplish this, we had to have a partnership of officers and men of the military and civilians in industry which would serve to continue in peacetime the working co-operation achieved in wartime.

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6. Being a definite part of the civilian-military team, with the opportunity of meeting with fellow team-mates in good fellowship and friendship.
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8. The Association monthly News Letter, published on the first day of every month, containing items of timely interest.
9. A Service Department which, upon order, supplies members with books, membership certificates, AFCEA insignia, etc.
10. A National Headquarters in Washington, D. C., which may be called upon for advice and assistance, by both individual and group members.

For further information — write to

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION

1624 Eye Street, N.W. Washington 6, D. C.

Your National Guard

SALE OR TRADE — DeForest's Radio-TV Electronics course, complete with scope, radio, VTVM kits, includes color. John R. Neff, Stronghurst, Ill.

FOR SALE — Webcor 1956 tape recorder, model 2611, records in both directions, never used, $160, FOB. A. Svirmickas, 2512 W. 69, Chicago 29, Ill.

FOR SALE — RCP sig. tracer, l. n., $25; Oak Ridge syn-sweep gen., $20; Supreme AAA diagnometer, $40. Local only. S. Davis, 520 Powell St., Brooklyn 12, N. Y.

FOR SALE — Proceedings of IRE, most issues from Oct., 1932 to date. L. O. Fischer, 15-09 Ellis Ave., Fair Lawn, N. J.

SELL OR SWAP — Eico 5" scope, model 425, never used, $30, or trade for Zenith Transoceanic portable, in perf. cond. F. Koehler, 807 Ardmore Pl., Bellmore, L. I., N. Y.

HELP WANTED — Two expert radio-TV and household appliance servicemen — one for bench — one for outside. Top pay for the right men. S. R. Hyans, 7401 Woodbine Ave., Philadelphia 31, Pa.

SELL OR TRADE — Sprague Kwik test KT-1, used very little, $20; Heathkit BG-1 bar generator, l. n., $10. Robert Harris, 742 Cleverly Rd., Dayton 7, Ohio.

FOR SALE — Heath portable tube checker, perf. cond., with picture tube adapter, operating instruction, $30, plus postage. T. E. Shaw, 3-20-27 Ave., Astoria 2, L. I., N. Y.

FOR SALE — Eico RF sig. gen. 320, exc. cond., $15 plus postage. Jos. Endlich, 759 Brooke Circle, Morton, Pa.

FOR SALE — Philco superhet 41-245 with provision for FM-TV (Audio), $10 less tubes; model 90, $12.50 less tubes; Stewart-Warner 102-A, $12.50 less tubes. You pay postage. N. Rau, 1509 Dewey Ave., Northampton, Pa.

SELL OR TRADE — Used radio speakers; VHF-Blonder-Tongue DA8-1-M distribution amplifier, l. n. Make offer or what have you? M. J. Knapp, RR 4 Kleitz Rd., Evansville, Ind.

WANTED — C-D Capacitors: Vol. 1, No. 2, Apr., May, June, 1937; Vol. 1, No. 4, Oct., Nov., Dec., 1937; Vol. 3, No. 2, July to Dec., 1939. J. J. Simpson, 85-39 152nd St., Jamaica 32, N. Y.

SWAP — Like new 300 w. $60 Blower slide projector with case; $70 electronic flash unit 80 w.; good 22 cal. automatic rifle, for good Hi-Fi equip. S. Rosenblatt, 63-109 Saunders St., Rego Park, Queens, N. Y.

POSITION WANTED — In radio or TV broadcasting, or as Airlines operator. Vet Navy radio operator, 3 yrs. Grad. Radio & TV School, have 3rd cl. telegraph license and 1st cl. phone. Age 32, can travel. Peter Cap, 233 Cook Ave., Yonkers, N. Y.

FOR SALE — In good condition, used oscillator; meter movements; VOM set; chargers. Edmund Bendheim, Box 146, Lincolndale, N. Y.

SELL OR TRADE — Kaar FM-40X rcvr., FM-175X xmitter, 152-162 mc. fixed freq. FM, 6 v. mobile, 15 w., with xtals and manuals complete except batt. Want comm. rcvr. J. M. Herrmann, 894 Lincoln Dr., Conneaut, Ohio.

FOR SALE — Simpson VOM meter, model 185, in good working cond., $5 plus shipping charges. David Boroff, 6051 N. Talman, Chicago 45, Ill.

FOR SALE — Factory wired and tested Johnson Viking II xmitter and Match Box antenna tuner. Both l. n., $300. J. L. Bucek, 5651 Primrose Ave., Indianapolis 20, Ind.

TRADE — Two UHF converters; 35 mm sound movies, also 16 mm silent and sound. Want radio and TV equip. R. E. Bridges, 217 Lineberger St., Shelby, N. C.

TRADE OR SELL — All types of ham gear and tubes, for photographic equip. Josh Sanford, Hillsboro, Wis.

SELL OR TRADE — Hi-Fi radio-phono., high grade sound system; Zenith transoceanic clipper; RCA and RCP sig. gen.; AAF helmet. Send list for trade. Grey Mather, 722 Charlotte St., Utica 2, N. Y.

SWAP — Complete ham station commercially built for new air conditioning (1½ tons, prefer GE or Frigidaire). Station equip. worth $400. Write for details to R. A. Bost, 628 Selma, Poplar Bluff, Mo.

SELL OR TRADE — Old style tubes, 20c each, 3" 0-500 ma. meter, $3, radio cabinets. Write your needs. Need DC meter, 20 amp., charge-discharge. A. Bulmer, 90 S. Main St., Rockland, Me.

SELL OR SWAP — Misc. radio gear for old glass, china, oil lamps, antique furniture. Joe Szabat, 16 Pearl Ave., Oil City, Pa.

TRADE — Hickock model 670 scope, l. n. Want Geiger counter or scintillator in A-1 cond. Sadler, Clayton, N. M.

WANTED — Good binoculars, camera, portable typewriter, RCA set tester model 8573, 808, or similar. Bob Robinson, 612 Charlotte St., Utica 2, N. Y.

SWAP OR SELL — "TV for Radiomen," by Noll; Surplus Conv. Manual, model 1; ARRL handbooks, 46, 48, 49; 49 copies Radio News, 187 QSTs. Best offer. N. Marshall, 455 Washington Ave., Dumont, N. J.

WANTED — Tape recorder; 80-10M car converter; 110 v. 60 w. gen. In trade for washer repair tools and many service manuals. Z. T. Bogar, Burtonsville, Md.

FOR SALE — Books, good cond.: "Electrical Engineering," Vol. I, Dawes; "Basic Mathematics for Radio," Maedel; "Essentials of Electricity" and "Essentials of Radio," Slurzberg & Osterheld. All for $25, prepaid. V. E. Hopler, 311 Dixon Ave., Boonton, N. J.

FOR SALE — 35 inch Capitol TV, $1,000; and a 30 inch U.S.I., $350. Jack Rosenberg, 2163 Polk St., San Francisco, Calif.

SELL OR TRADE — Complete xmitting gear: Eldico TR-75-TV, AM-40 modulator, and Eldico VFO-2 in good cond. Want xmitter of equal value. J. Squillaro, Box 950, Jordan Hall, Penn. State University, University Park, Pa.

FOR SALE — Jackson 640 sig. gen., $19; NRI (Aerovox) 112 R-C, $23; Rider TV model 5, $13; Electronic 902 6 v. bat. elim., $20. You pay postage. R. F. Olson, 3556 Lime Ave., Long Beach 7, Calif.

WANTED — TYPE AC coil for HRO-5TA1. Dalla T. Watts, 948 Marguerite Dr., Winston-Salem, N. C.

FOR SALE — Hammarland communications rcvr., l. n., guaranteed in every way, $165. Luch Radio & TV, 216 N. 9th St., Allentown, Pa.

WANTED — Small CW-fone xmitter, small multitester in trade for misc. items of value. H. Southwick, 316 Bank, Fall River, Mass.

FOR SALE — 1954 Ford truck radio in original carton, $32, postpaid. H. Ursillo, 694 N. Broadway, E. Providence, R. I.

WANTED — Used 8BP4 picture tube, reasonable. V. R. Valley, 4318 Banks St., New Orleans, La.

FOR SALE — Superior tube tester V-45, $5 plus postage. J. A. Barello, Acme, Wyo.

WANTED — 12WP4 TV tube in good cond. Have 7JP4 and 12LP4 to sell or trade. I. E. Frost, 643 Crescent Ave., Rumford, Me.

FOR SALE — Knight in circuit capacity checker with instruction manual, $13. A. J. Virgona, Rt. 44, Box 458, Metlars Lane, New Brunswick, N. J.

FOR SALE — National 1-10A rcvr. with all coils and manual, exc. cond., $25; Ameco code record albums novice and advanced, $5 ea.; ARC5T23 xmitter, 2 meters, $16. John Legge, 59 Berkeley Pl., Brooklyn, N. Y.

WANTED — Heathkit TS2 sweep gen.; Heath grid dip meter; Precision E200 sig. gen., old radio magazines. T. A. Bergman-H. A. Lorentzstraat 84, Den Helder, Holland.

FOR SALE — Radio rcvr. BC-312-D with Crystal phasing, $60; Triplett FM-AM sig. gen., model 3433, $50. G. Turkal, 518 Harding Ave., SE, Massillon, Ohio.

WANTED — Good comm. rcvr., prefer SX25 or NC88. Will trade BC696 converted for 80 meters without power supply and BC458 converted 40 meters with power supply. Prefer N. J. area. John Gubernard, 21 Arverne Terrace, Irvington 11, N. J.

WANTED — 120 w. modulation xformer for p.p. 807's. Geo. Leminger, 316 N. Willams, Paulding, Ohio.

FOR SALE — G. I. combination disc recording-phono-automatic changer mechanism, l. n., guaranteed; 75 w. PA system with 14" speaker, less mike and cabinet. Best cash offer. Carl Price, Jr., P. O. Box 37, Minford, Ohio.

FOR SALE — 3" scope; TS-3 TV alignment sweep gen.; 300 w. slide projector; sig. gen. SG-6; high-voltage probe 30,000 v.; lab. power supply; AC-DC portable radio. Stanley Bombka, 8107 N. Odell Ave., Niles 31, Ill.

FOR SALE — IRE "Proceedings" 1928 through 1945. Most volumes complete. Best offer. G. I. Jones, 9 Cedar Ave., Larchmont, N. Y.

FOR SALE — Car radios: Pontiac model 984296, $10; Philco Transitone model C1550, $5; Philco radio-phono, $10; Traveler model 5044 radio 3-speed, $30. Paragon TV & Radio Service, 170-26 Jamaica Ave., Jamaica 3, N. Y.

WANTED — Cash or trade for 6-12 v. battery eliminator, sig. gen., tube tester. W. F. Richardson, 4622 Blount Ave., Jacksonville 10, Fla.

SELL OR TRADE — Two Rek-O-Cut G-2, 16" turntables, exc. cond., 33 and .78 RPM. Make offer. Want 3-speed 16" turntable. John Gates, Burton Hall, Oberlin, Ohio.

SELL OR TRADE — Riders 7-10, 13, 14; 350 tubes in orignal cartons; 7" Delco TV, other equip. Want steam automobile, must be complete, not necessarily in running cond. Midwest only. Curtis Nippe, Strasburg, Ill.

WANTED — Schematics for console Teletone TV rcvr. model 348 and Electromatic model 606A radio and record player. Uses 12BH7, 12BA6, 12BE6, 12AT6, 35L6, 35W4 tubes. A. T. Weiss, 352 Orion Ave., Metairie, La.

FOR SALE — 10" RCA TV set model 8TS30 in fine working cond., inc. magnifying unit (cost $450), $25 cash. Max Adler, 850 Bryant Ave., Bronx 59, N. Y., Apt. 4A

FOR SALE — Wen model 250 soldering gun with extra soldering tip, good cond., $6. J. Luciano, 90 Columbia Ave., Newark 6, N. J.

WANTED — New or used 17" TV table model. Will swap slightly used Underwood (Fingerflite) portable typewriter, l. n., and cash. J. K. Radio Service, 51 N. 17th St., Paterson 2, N. J.

WANTED — Relay cabinet rack O.D. 22" wide, about 14" deep, 24 to 34" in height. O. H. Sandman, 1404 N. Glendale, Peoria 3, Ill.

SELL OR TRADE — Like new 50 w., 10 meter trans., BC-454B conv., BC-459A VFO, 10 to 15 w. mobile trans. with power pack, for best cash offer FOB, or trade for Sam's or test equip. Minnick Television, 223 E. 2nd, Cresco, Iowa.

FOR SALE — Keathkit 5" scope model 0-9, audio gen. AG-7, R. F. sig. gen. G-5, and tube checker TC-1. In exc. cond. with manuals for first $100. Bill Heinz, 1029½ Maiden Choice La., Baltimore 29, Md.

WANTED — One dial scale Crystal for Crosley model 1137. Will pay any reasonable price. Erwin E. Rice, 824 Utica St., Fulton, N. Y.

FOR SALE — CREI course, matched set in exc. cond.; Advanced Practical Radio Engineering, Specialized TV, Broadcast, Aeronautical, and Advanced Math., $50 plus postage. Thomas G. Smith, 820 North Bryant, Tucson, Ariz.

FOR SALE — Freq. meter BC221N AC-operated; automatic sending key (bug); GR Variac 5A rating; xformer for Heathkit tube tester. Want good 8 mm movie projector. D. Pomis, 401 Schenectady Ave., Brooklyn 13, N. Y.

WANT — QST, 1943-46 and 1948 issues; CQ for 1945-47. Will pay good price for copies in good cond. Jim Card, 1405 W. Springfield, Champaign, Ill.

WANTED — Used high quality FM-AM tuner, such as Browning, Craftman, Fisher, National. Give model, cond, and price. C. F. Crandell, 3015 Ivandell Ave., Dallas 11, Tex.

FOR SALE — $750 good radio service shop situated on court square in county seat in Arkansas, exc. location for good TV man. Lee Sprague, Star City, Ark.

WANTED — Commercial AM xmitter rated at approx. 100 to 500 w. and operating in 30-50 mc. band. R. B. Shannon, 302 Radcliffe Rd., E. Syracuse, N. Y.

WANTED — Tubes: transmitting, receiving, special-purpose industrial types such as Klystrons; Hickok tube checkers, Variacs, etc. Cash or swap for choice equip. and tubes. B. N. Gensler, 330 W. 11th St., New York 14, N. Y.

TRADE — 3" Jackson scope, Webcor wire recorder, meters, for tape recorder in good cond. David Levine, 1783 Fulton Ave., Bronx 57, N. Y.

SELL OR SWAP — ATR inverter, input 32 v. DC, output 110 AC, capacity 150 w.; GE dynamotor, input 28 DC, 3.7 amps. DC, output 590 v., 10 amps. AC. Geo. Lawton, 33½ Washington St., Newport, R. I.

SWAP — Viking Ranger xmitter; S-40B rcvr. with Selectoject filter; Q5ER with own power supply, for Viking II factory wired and with VFO. Local only. Art Stauch, 541 Princeton Rd., Linden, N. J.

FOR SALE — 1955 Fisher Geiger counter model Scout, $75; Pioneer, $40; Goldak model U-238, $55; 300 power microscope, $15.All l. n.. Joseph F. Abate, Box 392, San Carlos, Calif.

FOR SALE — Seven books, Riders TV manuals in good cond., $65. S. Wapniak, 889 Hunts Point Ave., Bronx 49, N. Y.

FOR SALE — Plasticor plastic molding machine model A. Works on 110 AC or DC, has heat rheostat, 9 molds, instruction book, four lbs.. plastic and tweezers. Make offer. Martin Wasserberger, 122 Pomona Ave., Newark 8, N. J.

FOR SALE — IRE proceedings, Jan. 1941-Jan. 1946; BC454-B 3-6 mc. rcvr.; Prop. pitch motor, large size. Make offer. Want mobile VFO; Dual 125 or 150 mmf., 9,000 v. vari. Leon J. Aro, 3104 Edgewood, St. Louis Park 26, Minn.

FOR SALE — 17 vols. Riders, $100; stock of TV tubes cheap; RCA VTVM; WV65A and misc. parts. Will sell part or whole. Val's TV Service, 71 East End Ave., New York 28, N. Y.

FOR SALE — Electronics books, l. n.: Modern Osc. and Their Uses, J. Ruiter, $3.50; Radio Physics course, Ghirardi, $1.50; Electrical Eng. Lab Experiment, Ricker and Tucker, $1; Alternating Current Machines, $1.50. All for $5. R. Sorenson, 620 2nd Ave., Redwood City, Calif.

FOR SALE — Precise test kits, RF osc.; marker gen., and VTVM kits. Will trade for 150-174 mc. police rcvrs. N. M. Griffin, 324 Center St., Ithaca, N. Y.

FOR SALE — TV Rider manuals, 1-6, $70; 6 v. Mallory vibrapack VP 555H, exc. cond., never used, $20. Ed Mort, 4863 Winifred St., Wayne, Mich.

FOR SALE — To PE-103 owners: 8 pin male Cannon plug made for the PE-103, $1.50 post paid. Jerome Horowitz, 37-21 Gardenview Ter., Fair Lawn, N. J.

FOR SALE — Receiver portion of SCR522 (BC624) complete with tubes, $18. J. B. Shinal, 23 Shamrock Ave., Seneca Falls, N. Y.

WANTED — Vertical transcriptions. Good offers on many I can use. James Orlando, Dickerson Run, Pa.

SELL OR SWAP — Gonset noise limiter, $5; Stancor SA-403A noise clipper, $5; AN/APS-23 transceiver less tubes, $5; electronics 6 v. vibropack, 300 v. at 100 ma. output, $9. Need Heathkit grid dip oscillator. Arthur Johnson, 29 Boone St., Bethpage, N. Y.

FOR SALE — Two 25-line, 5 trunks automatic electric private telephone exchanges, complete with 5 line finders and 4 step-by-step connectors, for 12 v. DC operation, $50 each, FOB. Emil Backstrom, Jr., 6 Pel Pl., Pelham, N. Y.

TRADE — Complete photographic set-up: 4 x 5 Graflex camera, 5 x 7 Solar enlarger, darkroom equip., for test equip. William W. Moore, 2000 S. Grant St., Arlington, Va.

WANTED — Riders radio and TV manuals; also Photofacts. N. C. Gates, 811 Grant St., Peru, Ill.

FOR SAFE — Power supply for rack mounting, 1500 v. at 400 ma., smoothing and swinging chokes, finest parts, for 230 v. AC operation, $50 FOB. M. J. Gatti, 422 Benson Ave., Glenolden, Pa.

FOR SALE — 813 final, max. 700 w. input, no modulator, coils for 80-40-20-15-10 meters, commercial powered bias supply, $225. David Kromenaker, 520 Stanley, Stevens Point, Wis.

WANTED — Tubes: transmitting, receiving, special-purpose, TV, etc. Prefer new, boxed (may be nested), standard brands, for cash or swap other tubes or equip. Mack O. Santer, 56 Crosby St., New York 12, N. Y.

FOR SALE — GE 10" TV rcvr., brown bakelite cabinet, base in exc. cond., recently aligned, has new selenium rectifiers, clean chassis. Best offer over $40. J. C. Pope, Box 21, Heflin, Ala.

SELL OR SWAP — 16" round metal picture tube and mounting and yoke; 807-W tube; RCA splatter choke for 500 w.; 110 v. 400 cycle isolation xformer; Hi-power antenna relay. Woolley, 1212 E. Pikes Peak, Colo. Springs, Colo.

WANTED — CQ and QST magazines up to year 1949 for cash or swap ham gear. G. Pasquale, 9421 Thornhill Rd., Silver Spring, Md.

SWAP — Ham gear, parts, tubes for stamp collections. K. Miller, Box 65, Groton, Conn.

FOR SALE — Millen 90800 50 w. xmitter, $15; 30 w. modulator, $12; Millen 92101 R'9er, $15; pair l. n. 810's, $12; pair 805's, $10; 829B, $5; RCA Victor 45 rpm player, $23. J. H. Travis, 302 Eheart St., Blacksburg, Va.

SWAP — WE 639A and Altec (WE) 633A microphone with 8B baffle, 9A swivel, 311A plug, 422A jack, and 712A adapter, for two Altec 670A or two RCA 77-D microphones. Russell Shouse, Jr., 239 S. Hawthorne Rd., Winston-Salem, N. C.

FOR SALE — Vibrator converter, model 110 RT 15, input 110 v. DC, output 110 v. AC, watts cont. 150, watts int. 250. James C. F. Shafer, 812 Huron Rd., Rd., Cleveland 15, Ohio.

FOR SALE — Rebuilt 20 HP4A TV tube unused; focus and deflection coil; high gain amp.; batt. charger; GE triple play cartridge with sapphire needles; Radio City model 308 tube checker. Make cash offer. Ernest Siegel, 181 Pacific St., Paterson, N. J.

SELL OR TRADE — Very early radios and some literature, from a collector of one of world's largest private collections of antique radios and phonographs. W. H. Miller, 1017 Westgate Rd., Troy, Ohio.

FOR SALE — Like new BC645-420-500 mc. WE xmitter/rcvr. with 17 tubes and diagrams, $15; Electrical Apparatus Co. dynamotor 6 v. input 200, v. DC output, 120 amps. filtered, $8, FOB. Bremer Radio, 43 Washington Ave., Lake Hiawatha, N. J.

SELL OR SWAP — Assorted Sams Photofacts, 75c ea. and Wallace's Telaids, $1.25 ea. postpaid. Write for lists. Interested in exposure meter. William Brown, 111 Genevieve Ave., New Orleans 23, La.

SELL OR SWAP — RCA Rider Chanalyst, l. n., $75; Coastwise audio oscillator, model 710, $25; C-D Decade Capacitor, CDB5 and CDB3, both $11, all postpaid. Want movie equip. Jules A. d'Hemecourt, 152 Genevieve Ave., New Orleans 23, La.

FOR SALE — Professional sig. gen. 170 kc., 120 mc. RF modulated and audio output, good cond., $49; Hallicrafter S53A comm. rcvr., l. n., 30 days warranty, 16 mm movie cameras: B & H, $299, Kodak, $29. William Rolff, 320 Broad St., Carlstadt, N. J.

TRADE — Philco Precision visual alignment gen. model 7008 with test leads and instruction manual, l. n., for good 16 mm sound projector. William L. Morrow, 310-312 Main St., Toronto, Ohio.

FOR SALE — Unused Signal Corps PE-103A dynamotor, $27.50; Sig. Corps BC-221 freq. meter, perf., $65; Rider's 6-22, perf., $100, all FOB Redding. Melvin R. Grenvik, 754 Yuba St., Redding, Calif.

WANTED — "Microwave Design Transmission Data" by Moreno, published by McGraw-Hill, state cond. and price. George M. Underberger, 6213 Alonzo Ave., Reseda, Calif.

TRADE — Hickok test equip. Riders manuals, books, TV sets, for first-class ham equip. like Collins. Charles E. Spitz, 1420 S. Randolph St., Arlington 4, Va.

FOR SALE — TV VHF Simpson field strength meter with standard coil turret tuner, $50. Monroe's Radio and TV Service, 1335 Northmoreland Blvd., Cuyahoga Falls, Ohio.

FOR SALE — GE plate xformer, 4,400 v. CT, $20; TV-40 Superior CRT tester, l. n., $10; NRI Communications course with kits, $15; Meissner sig. shifter kit, $50. Ray Radio, Box 595, Lancaster, Ky.

WANTED — HQ129X or HQ140X rcvr. State price, serial number, and cond. B. L. Norcross, 42 Laurel Ave., Linwood, N. J.

TRADE OR SELL — Sams Vols. 1-9, Radio Electronics, and Radio & TV News, May to date; 4 x 5 Graphic, Omega enlarger, etc. Want Elmac AF-67, Collins 32V-3 or KWS-1. Howard Abernathy, Batavia, Iowa.

SELL OR TRADE — Complete Jerrold System incl. 7 channel amplifiers and some distribution boxes. Best offer. Want used 10 kw Electronic induction heater. Leon Braun, 1111 E. Elizabeth Ave., Linden, N. J.

TRADE — Unused 1.5-3 mc. Aircraft rcvr., 250 photo magazines, 5 x 7 Morse developing system. Need Hi-Fi speaker and TV tubes. Osborne, Box 177, Newland, N. C.

SELL OR SWAP — Large quantity, l. n., parts, kits, test equip. used in training program, exc. cond. Interested in sound projector, tape recorder. Jay's Radio Service, 3221 DeSoto St., New Orleans 19, La.

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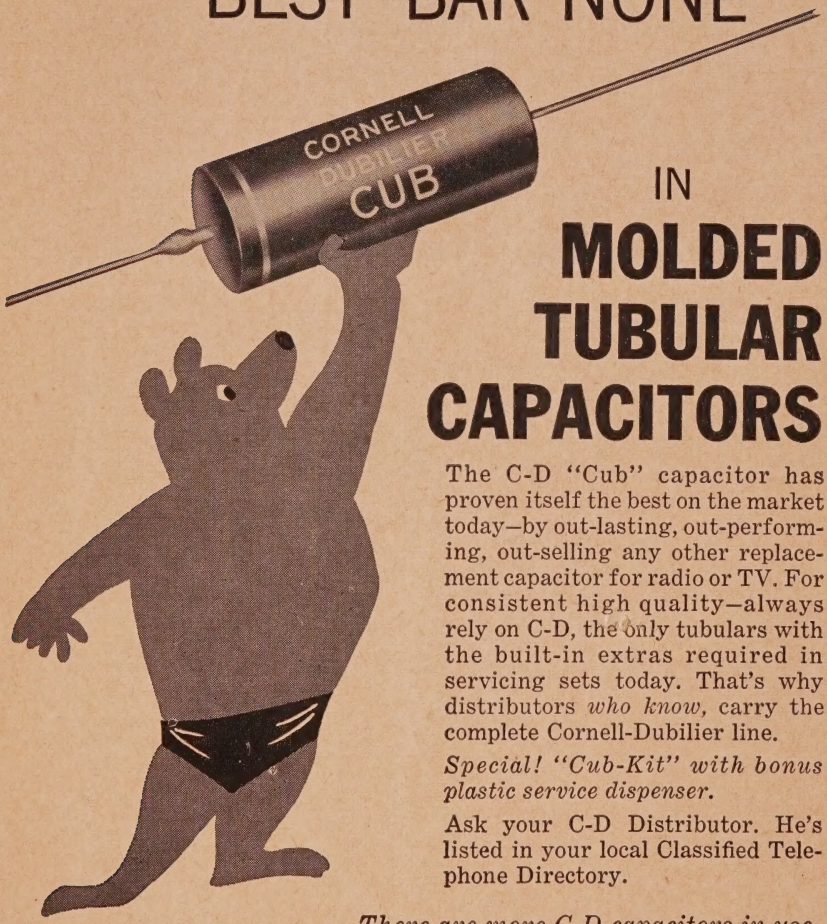

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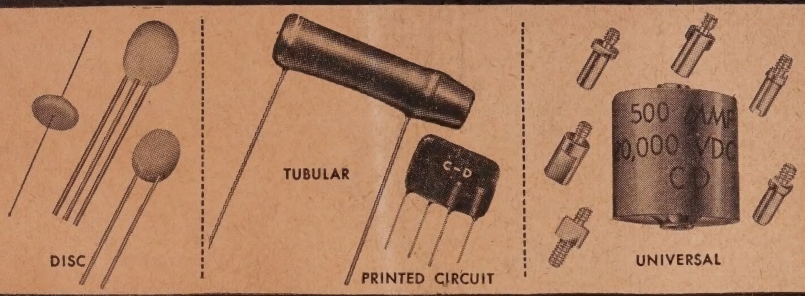

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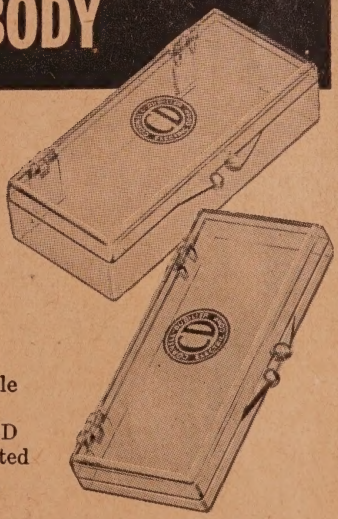

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